The CHEMIST

MARCH, 1942 VOLUME XIX, No. 3

LICENSING THE CHEMIST

• • •

THE HUMAN SIDE OF RESEARCH AND INVENTION

The CHEMIST

Publication of
THE AMERICAN INSTITUTE OF CHEMISTS, INC.
V. F. KIMBALL, *Editor*, 233 Broadway, New York City
VOLUME XIX MARCH, 1942 NUMBER 3

THE AMERICAN INSTITUTE OF CHEMISTS
HOWARD S. NEIMAN, *Secretary*
233 Broadway
New York, N. Y.

Entered as second class matter April 8, 1936, at the Post Office at New York, N. Y., under Act of August 24, 1912.

Issued monthly except in June, July and August at 233 Broadway, New York, N. Y.
Subscription price, $2.00 a year. Single copy, this issue $0.25

CONTRIBUTING EDITORS (Continued)

Ivy M. Parker, 4741 Pease Ave., Houston, Texas.

W. B. Parks, 105 West Potlitzer, Pittsburg, Kansas.

J. M. Purdy, The Lowe Brothers Company, Dayton, Ohio.

Ashley Robey, P. O. Box 96, State College, Arkansas.

Milton O. Schur, Brown Company, Berlin, New Hampshire.

G. C. Scott, Minnesota Valley Canning Company, Le Sueur, Minnesota.

Kenneth A. Shull, 2437 Bryn Mawr Avenue, Ardmore, Pennsylvania.

Alexander J. Stirton, Color and Farm Waste Division, U. S. Department of Agriculture, Washington, D. C.

Margaret C. Swisher, University of Buffalo, Buffalo, New York.

Harold H. Tucker, 4759 N. Woodburn Street, Milwaukee, Wisconsin.

IN THIS ISSUE

Objectives
of the
AMERICAN INSTITUTE of CHEMISTS

To give chemists professional solidarity.

To put the profession back of a definite code of ethics.

To insist on adequate training and experience qualifications.

To educate the public to an understanding of what a chemist is.

To protect the public and the profession by fighting quackery.

To raise the economic status of chemists.

HOWARD S. NEIMAN, *Secretary*
The American Institute of Chemists
233 Broadway, New York, N. Y.

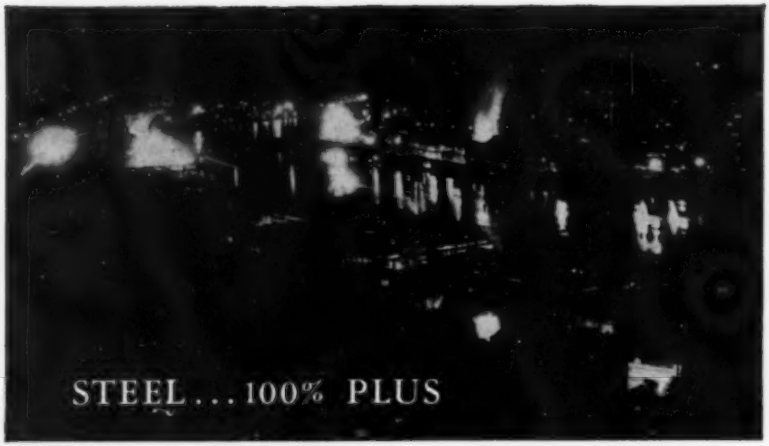
Please send me an application blank for membership in the American Institute of Chemists.

Name .....

Position .....

Address .....

City ..... State .....



Wherever you go, you will find that steel chemists favor Baker's Analyzed C. P. Chemicals, low in Manganese.

Baker's Analyzed Ammonium Persulfate, C. P. Crystal, Potassium Periodate, C. P., and Sodium Bismuthate, C. P. Powder, are all extremely low in Manganese. Not only does the label designate the actual analysis of Manganese, but designates also all other important impurities exactly as found by our analysts.

Think what this label means to the chemist who must operate at top notch speed and *still* be assured of accurate findings.

You may test for Manganese colorimetrically by means of Ammonium Persulfate, Potassium Periodate or Sodium Bismuthate by oxidizing the Manganese in a strong acid solution to Permanganic Acid. Or you may test for Manganese by oxidizing in a Nitric Acid solution to Permanganic Acid, which, in turn, is reduced by either standard Sodium Arsenite or by Ferrous Ammonium Sulfate. In either case Baker's Analyzed C. P. Chemicals save time and are dependable.

More than 60 well known laboratory supply houses strategically located throughout the country are well stocked and eager to supply you with Baker's Analyzed C. P. Chemicals and Acids. For prompt and efficient service we urge you to get in touch with your favorite supplier.

J. T. BAKER CHEMICAL CO.

PHILLIPSBURG, NEW JERSEY

NEW YORK	PHILADELPHIA	CHICAGO
420 Lexington Ave.	220 South 16th St.	435 N. Michigan Ave.

BAKER'S ANALYZED C. P. CHEMICALS ARE SOLD BY THESE REPRESENTATIVE LABORATORY SUPPLY HOUSES

Licensing The Chemist

The New York Chapter held a discussion on licensure at its meeting on February thirteenth. Some of the high points of this discussion are given here for the information of our readers who have asked "What does licensure mean to chemists?"

Licensure from the Viewpoint of a University Professor

by William Howlett Gardner

Research Professor, Polytechnic Institute of Brooklyn

IT IS my pleasure this evening to discuss the question of Licensing the Chemist from the viewpoint of a university professor. Everyone is well aware of the fact that the teaching profession was well established even at the dawn of history and has enjoyed down to the present time a prestige, influence, and power which have been the envy of all other professions. Academic freedom of the individual professor is well established by law, and has been written into the charters of many of our modern institutions. The American Association of University Professors is one of the most powerful of the professional groups. It has attained this pre-eminent position through constant support by public opinion, by means of which it has been able to bring the most recalcitrant of the state governments around to the views of the profession. The reason that the teaching profession has been able to enjoy power and prestige for centuries has been due to the fact that this profession has kept ever before it the individual responsibility of its members to public well-being. This individual responsibility for the common weal is the basis of all professions, and is the sole excuse for their existence.

You might legitimately ask, therefore, why should one who is a member so well entrenched in a profession be interested in the licensing of the chemist. The two things are very closely allied. Individual professions as we know them today began to take form with the rise of

universities. This movement took place shortly after the Renaissance and lead to the early establishment of the professions of Divinity, Law, and Medicine. As Science grew in its relation to public weal, other groups such as chemists, physicists, and engineers aspired to professional status. Their success in attaining this objective was based upon their work in the universities. The training of men for the various professions is thus one of the most serious functions which we have today to perform as members of the teaching profession. One of the greatest services which we have to carry out as teachers is the molding of opinions to assure that professional men do not lose sight of their major objective in life, the application of their knowledge in enhancing the public well-being. One cannot succeed as a teacher in this endeavor without setting an example to one's students. If the teacher be a chemist, he must therefore become a leader in promoting the profession of chemistry.

Laws must be set up which will eliminate from the professions the incompetent and the dishonest, the quacks and the fakers, if the public interest is to be properly safeguarded. It has become a common English and American custom to accomplish this through licensing. The American Chemical Society has done much of recent date to aid in more firmly establishing the legal status of Chemistry as a profession. I refer to the recent decision of the National Labor Board, January 13, 1942, which is reviewed in the February tenth issue of the *Chemical and Engineering News*. This decision however still leaves much to be desired from the standpoint of establishing who are those qualified in general to be called chemists. Any soundly drafted bill of licensing should therefore contain three features:

1. A clear-cut definition of a chemist, so that the profession is protected beyond question from those who seek to use it for anything but legitimate purposes.

2. To clearly establish the professional status of chemists in the minds of the lay public.

3. To protect the chemist in his attempt to maintain this status.

This is the essence of the bill for the permissive licensing of chemists which received the support and endorsement of THE AMERICAN INSTITUTE OF CHEMISTS in the legislature of the State of New York.

But why turn to the Government in order to establish the definition of a chemist? The answer to this question is a simple one. There is no other body who might recognize the chemical profession who would be less apt to be challenged in either its definition of a chemist or its protection of his professional status. Certainly there is no regimentation in seeking voluntary licensure. The success, however, of any such endeavor rests with professional men themselves even after licensing of chemists has become established. It remains a duty of the profession to see that the bodies entrusted with the administration of these laws enforce the ethics of the profession in carrying out their responsibilities in protecting the public weal.

Some of the Possible Benefits Through The Licensing of Chemists

1. Will define who is a fully qualified chemist and who is not. Wide differences of opinion exist at the present time as to what constitutes a chemist and various organizations have advanced different definitions.

2. It will serve to give qualified chemists legal professional status in building up and strengthening their profession.

3. It will prohibit the use of the term "chemical" by manufacturers not employing qualified chemists.

4. It will serve to amplify the need of adequate training and experience in becoming a qualified chemist.

5. It will strengthen the profession, hence indirectly aid in raising the standard of teaching of the science and the professional training.

6. Prevent men, unqualified for other professions from practicing these professions on the border fields as chemists, as for example, men rejected by the chemical engineering profession, medical profession, pharmacy.

7. It will serve as a guide to the general public as to who is a qualified chemist.

8. It will serve as a guide to other professions as to who is qualified to properly work with them, as for example, with the medical profession bio-chemistry, in the analysis of drugs, in the legal profession to act as witnesses, etc.

9. It will serve as a protection to the general public. Errors caused by unqualified chemists may readily cause many injuries and deaths before it comes to the attention of the Pure Food and Drug Administration. Numerous examples can be cited as to how the work of chemists

will affect public health and welfare even where they are employed in industry.

10. It will serve to strengthen the profession in general against the tendency on the part of labor to encroach on the general professional field.

11. It will serve as a check on the recent moves of labor to embrace management.

12. Aid in defining the field of chemistry in relation to other professions.

How Licensure Affects Professional Engineers

Mr. Stephen L. Tyler, executive secretary, the American Institute of Chemical Engineers, reviewed the history of the development of licensing legislation for professional engineers. The taking out of a license is a personal matter, and whether the engineer wishes to be licensed or not is for the individual to decide. One thing which can be said in favor of licensure is that, to the younger chemist it is a definite symbol of his advancement in his professional field. When he comes out of college, the employer is able to classify or rate him according to the college or accredited department where his training was obtained. After a few years of employment he has progressed to the point where he is eligible for the professional license, and thus he has reached another milestone of progress along the path of his career. It definitely improves the status of this man among his fellow men. At the present time forty-four of the forty-eight states have licensure legislation passed or pending, and the feeling among engineers is that they took the correct action and are in favor of licensing as it now exists.

Licensure from the Viewpoint of the Industrial Chemist

Dr. John E. Schott, research chemist, Tide Water Oil Company, speaking from his own experience, felt that licensure was important to the research chemist to establish his status in the industry. The chemist is now employed under a broad range of classification, for the employer is not always sure where the research chemist fits into his organization

or what his status is. The chemist may be measured in terms of a craftsman, rather than as a professional. A properly administered license situation will give him a professional position equal to that enjoyed by law and medicine. The system of licensure will offer to the employer a guide to the selection of his personnel, and it will be easier for him to separate the qualified from the unqualified men. The chemist will have confidence in himself and inspiration to advance the field in which he is engaged. His standards will be those of a professional man rather than those of a technician. Licensure will give him that sense of security and confidence in his professional status which will enable him to obtain satisfactory contracts and agreements to insure his future, for in terms of management, the employer will not judge him as a craftsman but as a professional man with professional responsibility to render specific services.

Dr. Lincoln T. Work, director of research and development, Metal and Thermit Corporation, did not feel that licensure was the solution to all problems, nor that it was without grave deficiencies, but that it was a step on the way to strong professional recognition. "I want chemists to feel that somewhere in life they can find sufficient professional and economic recognition to make them feel happy that they selected chemistry for their life work."

Some Questions and Answers Concerning Licensure

Must every chemist obtain a license under the proposed licensure act in New York State?

No. This proposed licensure act is "permissive legislation". A chemist may apply for a license if he feels that such a license would benefit him personally. If he does not feel that he needs a license, it will not be required of him.

Why should the chemist want a license?

There are many reasons why he would want to establish his professional status: To be regarded as a professional man with professional responsibility; to indicate that he has reached that stage of his career when he is qualified to obtain a license; to indicate his qualifications as a chemist; to unify the profession as a whole; to clarify his status

in the mind of employers; to give him the confidence and security of a professional; for the guidance of courts in questions involving professionals; to contribute to the service which an organized profession can give. Many other reasons will occur to the chemist who is serious about his professional future

What is one of the objectives of licensure?

To protect the profession of chemistry by giving a clear-cut definition of "chemist" so that those who seek to use this title illegitimately are legally prevented from so-doing.

How else will licensure serve the profession?

It will clearly establish the professional status of chemists in the minds of the lay public.

How will licensure protect the public?

It will serve as a guide to the general public to indicate to them who is qualified to act as a chemist, and it will thus protect the public and the profession from errors made by unqualified chemists. Numerous examples can be cited to show how the work of chemists affects public health and welfare.

Will it be difficult to meet the requirements to obtain a license?

No. As a matter of fact, many chemists engaged in industrial work and teaching now have higher qualifications than would be set by licensing laws, but at the same time, there are chemists using the title who are not entitled to it. The elimination of this latter group would raise the professional standard in the minds of the public.

How has licensing benefitted other professions?

The legal and medical professions found that licensure, by legally defining these professions, was the most effective and quickest means of ridding these professions of the incompetent, the dishonest, and the quacks, and of affording legal means of eliminating them when found. Licensure has been one of the methods by which these professions have reached their present enviable position.

Will licensure "cure all the evils" afflicting a profession?

No. But it is a step forward toward establishing that profession more strongly.

Will licensure "regiment" the profession?

No. It will merely legally define it.

Will licensure raise the standards of the profession?

It will help to do this, but it must be supplemented by the application of the professional code of ethics; by constant improvement of education to incorporate new scientific progress; and by progressive attitudes on the part of its members

What is the reaction of many chemists to licensure at the present time?

Chemists have shown much interest in the subject. It was discussed by various chemical groups at meetings in New York and New Jersey during the past few weeks. The New York Chapter of THE AMERICAN INSTITUTE OF CHEMISTS has gone on record as heartily approving it, and is preparing for licensure in New York State.

Is there much opposition to licensure?

No. Several of those who profess to be opposed to it have admitted that they frankly do not understand what it involves. Many who at first opposed it, approved it after they understood its importance to the profession.

Those who wish to contribute to further discussion on this subject are invited to send correspondence to the secretary of THE AMERICAN INSTITUTE OF CHEMISTS, with permission to publish letters of interest.

Concern for the Future

This concern for the future is a matter of stern, practical sense. The specialized talents and abilities that are meeting this emergency and those that will meet emergencies to come are not produced by feverish last-minute activities. No amount of pressure can suddenly create a supply of thoroughly trained and broadly experienced physicists, mathematicians, chemists, biologists, economists and political scientists. These men represent the trained intelligence without which a war cannot be won, or a lasting peace achieved. They emerge spontaneously, unpredictably, but irresistibly out of long, patient and sustained effort. Pure research, the clean urge to gain new knowledge, the sympathetic appreciation of imaginative scholarship even when it seems remote and unrelated—these we must steadfastly sponsor or our vital intellectual resources will fail us in the days to come.

—RAYMOND B. FOSDICK, *President,*
Rockefeller Foundation

The Human Side of Research and Invention

by **Harry L. Fisher, F.A.I.C.**

President of The American Institute of Chemists

A talk presented at the meeting of the Washington Chapter, March 16, 1942; and also, in abbreviated form, under the title, "The Personal Side of Some Important Rubber Inventions", at the testimonial dinner for the author held by the New York Chapter, December 12, 1941.

Invention

Invention is a very human accomplishment. It has made possible the onward march of civilization. The word invention comes from the Latin words *in* and *venire*, meaning to come upon or to find—a sound derivation. Invention relates not only to such material developments as the steam engine, the telegraph, and radio, but also to such an abstract thing as the alphabet. It has been said that "Necessity is the mother of invention." This, of course, is not always true. Witness, for example, the invention of the phonograph; sound tracks were known long before Edison reversed the process.

The course of an invention in the public mind varies, but if the invention is really good, at first it is considered great, then later that there is not much to it, anyone could have done it, and finally it is no invention at all. This general thought was well put in verse three centuries ago by Milton in "Paradise Lost." You may recall that after Satan and his cohorts had been repulsed by Michael and his angels, Satan withdrew and then it was that he invented gun powder and artillery. He described his invention in the great council of Pandemonium, and Milton goes on to say,

"The invention all admired; and each
how he
To be the inventor missed, so easy it
seem'd
Once found, which yet unfound most
would have thought
Impossible."

How do inventions and discoveries come about? Out of thin air? From necessity? By way of inspiration, guess or the scientific hunch?

I once heard Thomas Midgley give a lecture on the discovery of lead tetraethyl. He spent almost half an hour filling a blackboard with many physical and chemical data, and then added, "This is the way it should have been discovered, but wasn't!" How easy it is to miss a good discovery is also told by Thomas Midgley in the section on "Development of Organic Fluorides" in his Perkin Medal Award address on "From the Periodic Table to Production." He had bought five one-ounce bottles of

antimony pentafluoride. The material in the first one worked all right and the dichloromono-fluoromethane formed was found to be non-toxic. Then the contents of the second bottle were tried and it gave a product which proved to be toxic since it contained phosgene. The other three bottles also were "badly contaminated with a double salt containing water of crystallization" which "makes phosgene in ample quantities as an impurity." Suppose he had opened one of the other bottles first!

Types of Research Problems

There are two general types of research problems. In one type it is possible to obtain such complete data that only one conclusion is possible, like in determining the conditions of temperature, pressure, relative proportions and proper catalysts to give the best yield of a compound. With intelligent planning, the solution of the problem is certain to be obtained. In the other type, however, where the possibilities are almost infinite and it is hardly possible by mere industry to accumulate sufficient data to solve it, then "A flash of genius is necessary" or "a leap of the imagination" is required. How does this leap or flash come about? What are the necessary or desirable conditions of the mind or what conditions of environment make it possible for the mind to bring about the inspiration or hunch that makes for a useful discovery? The answers are as diverse as the human beings who make the discoveries. "Thorough preparation and alert mental faculties", good rest, selected reading or stimulating conversation are all helpful. Inspirations and insights usually "come to men who work intensely." And, as David Wesson once said, "it seems to be like the dropping of a crystal into a supersaturated solution." Good health helps, and yet Wallace conceived his idea of the theory of evolution while in bed sick with malarial fever.

When the inspiration does come, the entire environment is impressed deeply on the discoverer. Darwin tells how he carried through life the picture of the spot on the country road where his carriage was when the idea of the theory of evolution came to him. Without in any way trying to compare my work with that of the great evolutionist, I might add that I well remember how the solution of a problem of making an absorption bottle for organic combustions came to me after many days of hard work during a hot humid June. I was returning home from Columbia to Jersey and while riding on the subway the idea literally struck me just as the train was drawing into the Fifty-ninth Street Station, and thus there came to me the basis for my first patent.

Enthusiasm sometimes seems to lead one to rapid accomplishment of the solution of a problem. In this general connection I might add that one day when I was visiting my friends on the staff at Columbia I was told that my name had been sent in to Dr. Howe as the one to write the sketch of Professor Bogert in the series of "American Contemporaries," when he was sixty-five years old. I became so intensely interested in doing this, that that night I woke several times and wrote down my thoughts. By morning the entire sketch was almost complete except for the polishing. Many a person has gone to bed with an unsolved problem on his mind and has awakened in the morning with the problem completely solved.

Personal discussion often helps to clarify a problem and sometimes literally presents it face to face for solution. I recall having a discussion with

an assistant on a problem of preventing the loss in material in a side reaction because of a probable rise of temperature, even though ice-cold solutions were used. I happened to remember that the reagent showed a negative heat of solution in water and suggested taking advantage of this property by adding it directly in solid form instead of in solution. The suggestion worked, and the commercial yield was jumped from thirty-five to ninety per cent—and my salary was jumped a nice one-thousand dollars. Intense thought often separates a person completely from his immediate environment. John E. Teeple told the story of how one morning his mind was so engrossed in a problem while he was taking a bath that he took two baths although he did not realize what he had done until he "came to" when he noted that the towel was wet!

Some Important Rubber Inventions

In order to give more detailed information about how inventions and discoveries are made I will cite some examples in the field with which I am most familiar.

Cut Sheet Rubber. The early development of the rubber industry in England was largely in the hands of Thomas Hancock. He took out his first patent in 1820, "For an improvement in the application of a certain material to various articles of dress and other articles, that the same may be rendered most elastic." In other words he used strips of unvulcanized natural rubber in fabric and applied them for the wrists of gloves, for waistcoat backs, for attaching "to pockets, to prevent their being picked," for "braces, garters, boots, shoes, etc." The method produced considerable waste, and since the supply of fresh rubber was scanty and expensive he needed a means of working up the waste. He observed that fresh cut surfaces would unite and by punching out pieces he built up solid blocks four to five inches long and one inch square and kept these in a mould under pressure for many weeks until all the strains were equalized. From these blocks he then was able to cut sheets for his elastic fabrics.

The Masticator. The method just mentioned took care of only part of the scrap. "Revolving in my mind the readiness with which newly cut surfaces would unite, I thought that a tearing action might do better than simply cutting. This could only be done by a machine, and I accordingly constructed a small experimental one." It consisted of a solid cylinder revolving inside a hollow cylinder with iron spikes or teeth on the outside of the solid and inside of the hollow cylinders, like an ice machine. The pieces of rubber worked in this machine came out not in shreds, but in a ball, "a solid homogeneous mass." This discovery marks the beginning of modern rubber manufacture. The machine was kept secret for several years and was always referred to as the "pickle."

Vulcanization. The discovery of vulcanization is the greatest discovery in rubber. Charles Goodyear, a young hardware merchant, became interested in rubber by seeing a life-preserver in a store in New York. He bought one, and made an improvement on its method of inflation. The agent in the store encouraged him, and "He commonly applied his mind to the subject, to find, if possible, the best way of improving it, or removing the defect, always contesting the common maxim, that for the interest of the trade, 'things

should be so made that they will not *last too long.'"* After several years of much poverty and some successes, "he received an order from the Government for a considerable quantity of mail-bags." After having been manufactured, they were exposed as usual for inspection and they dropped "off the handles." "Frequent visits to the factory at Woburn became necessary, for the purpose of closing up and discontinuing the manufacturing operations at that place."

"While on one of the visits above alluded to, at the factory at Woburn, and at the dwelling where he stopped whenever he visited the manufactory at Woburn, the inventor made some experiments to ascertain the effect of heat upon the same compound that had decomposed in the mail-bags and other articles. He was surprised to find that the specimen, being carelessly brought in contact with a hot stove, charred like leather." Thus, in 1839, Goodyear solved the great problem and gave the world a method which is still the basis of the rubber industry. He worked hard all that winter and slowly and patiently found out the necessary conditions for carrying on the process commercially and for obtaining his patent. He was so poor that he was able only to make a caveat in 1841, but this gave him the field until he was able to apply for the patent itself, in 1843.

In the meantime news of the process reached Thomas Hancock in England. Later, in his "Personal Narrative," Hancock wrote, "Sometime in the early part of the autumn of 1842, Mr. Brockedon showed me some small bits of rubber that he told me had been brought by a man from America, who represented himself as the agent of the inventor; it was said they would not stiffen by cold, and were not much affected by solvents, heat or oils." The samples "had a slight smell of sulphur, and I thought that a little sulphurous powder had been rubbed on to mislead." After spending several months on the problem without success, he recalled the presence of sulphur on the samples, and "Revolving in my mind some of the effects produced by the high degree of heat I had employed in making solutions of sulphur and rubber, as before stated, in oil of turpentine, it occurred to me that as the melting point of sulphur was only about 240° (F) which I knew would not be injurious to the rubber, it would be well to see what would ensue on immersing a slip of sheet rubber in sulphur at the lowest melting point." He made a number of trials and "found that not the least 'changing' effect had been produced. I now replaced them, and raised the temperature of the sulphur, and allowed them to remain a considerable time; and on withdrawing one of them the fourth time, found, to my great satisfaction, that it was perfectly 'changed;' . . . the other slips remained in the sulphur whilst this examination was going on, and on withdrawing them, I found the lower end nearest the fire turning black, and becoming hard and horny, thus at once and indubitably opening to me the true source and process of producing the 'change' in all its states and conditions, and in all its pure and pristine simplicity . . . the excitement I then felt is somewhat revived whilst I am writing the account of this stirring incident in my operations." His friend "Mr. Brockedon proposed the term 'Vulcanization.'"

Organic Accelerators. In the early 1900's the Diamond Rubber Company was manufacturing a cheap low grade rubber by dissolving Pontianac resin in gasoline and precipitating it

with acetone. The product thus obtained was slow curing like all low grade natural rubbers. A. H. Marks, president of the company and a chemist, found that Fine Para rubber after having been extracted with acetone gives a poor product upon vulcanization, and that when some of the extracted materials are added to a low grade rubber, and the mixture vulcanized a much improved product is obtained. He thought that something else could be found to do the same thing to the rubber prepared from Pontianac or Jelutong. This problem was given to George Oenslager in 1905, and he determined to try the action of at least one compound of each of the commonly available elements, and then try organic compounds. Among the inorganic compounds mercuric iodide proved to be very effective and many tires were made with it as the accelerator. However, no accelerated aging tests were available, and in practice the tires aged very poorly.

Without even waiting for the results from the experimental tires, he turned his attention to organic compounds. The good inorganic accelerators long used in rubber, namely, white lead, litharge, lime, and magnesia, are basic in character and therefore he reasoned "It would seem natural to conclude that organic bases completely soluble in rubber might be a most satisfactory catalyst. Aniline, being one of the simplest, commonest and cheapest of the organic bases was the first which I investigated" and it "was found to have marked value as an accelerator." Urea and hexamethylenetetramine also gave good results. He then looked for a derivative of aniline which would be a solid and melt in the rubber during the mixing or the vulcanization, and found thiocarbanilide to be even better than aniline itself. By the latter part of 1907 all tires in manufacture by the Diamond Rubber Co. were made using thiocarbanilide in the tread and aniline in the carcass. The organic accelerators proved their worth by great savings and improvements since they shorten the time of vulcanization and also give better physical properties and better aging to the rubber vulcanizates.

Antioxidants. The early accelerators, including especially p-aminodimethylaniline, which was introduced by David Spence and used for many years by the B. F. Goodrich Co., were also antioxidants since they retarded aging. Oenslager noted that a vulcanizate containing p-amino-dimethylaniline when placed next to a piece of molded balata protected it from rapidly becoming brittle on the surface.

However, these accelerator-antioxidant compounds in other respects were not as satisfactory as they might have been. Furthermore, there were other accelerators which had satisfactory characteristics but were poor-agers.

At Goodrich, early in 1923, H. A. Winkelman and Harold Gray "were carrying through a rather extensive research on accelerators, hoping to obtain one or more which would contain both satisfactory accelerating and antioxidant properties. Some of the materials which we felt should produce these characteristics showed little, if any, accelerating properties. One day at noon, we decided that we certainly could not be one hundred per cent wrong and if these materials did not produce any accelerating characteristics, perhaps they would have the required antioxidant properties. The thing to do with them, we reasoned, was to put them with some material which did have good accelerating characteristics to see if they really did have the antioxidant properties we were looking for. One of the early ones we tested in this

fashion was aldol alpha-naphthylamine. Thus was born the non-accelerating antioxidants."

Carbon Black. The first use of carbon black is generally accredited to J. D. Tew and George Oenslager who introduced it in 1912 as a reinforcing agent and wear-resister for tire treads.

Up to the beginning of the last war (1914) zinc oxide was the chief substance used for resistance to abrasion in tires. After the war started, the companies manufacturing zinc oxide stated that paint would come first in their distribution, and this curtailment brought about the general commercial use of carbon black.

X-Ray Diffraction Pattern of Stretched Rubber. In 1924, J. R. Katz, in Delft, was studying the x-ray diffraction patterns of cellulose and other high molecular weight substances, and noted that cut sheet rubber gave the "amorphous ring" which is given by liquids. The circumstances of the discovery of the diffraction pattern when rubber is stretched were told to me personally by Dr. Katz several years before his death and are somewhat as follows. He was in the habit of working in his laboratory all day Sundays. For his assistant he had a very capable young lady whose first name, as I remember it, was Hulda. One day during the summer, when he was anxious to put in his usual full day's work Hulda objected because she wanted to go to the beach. She went, and Dr. Katz felt obligated to show her when she returned that he had really done a full day's work. His apparatus for x-ray examinations held six cameras, all of which were used at the same time and several hours were required for taking the pictures. On this particular day, he had samples ready for only four of them. What else should he try? Looking around the laboratory his eye rested on a piece of cut sheet rubber on his desk. He picked it up and stretched it, and lo, the transparent amber strip changed to opaque and white. He allowed the rubber to retract, and the amber color and transparency returned again.

He repeated this several times and noted that the change took place each time. He thereupon fastened the rubber in a stretched condition at the proper place and took an x-ray picture of it. When the plates were developed that night, it was this picture that showed that rubber when stretched gives an x-ray diffraction pattern indicating crystallinity or definite orientation of the rubber particles. Thus, in another case although in a different way, Necessity was the Mother of Invention!

Bibliography

W. Platt and Ross A. Baker, "The Relation of the Scientific 'Hunch' to Research," Journal of Chemical Education, **8**, No. 10, 1969, October, 1931.

Thomas Midgley, Jr., "From the Periodic Table to Production," Perkin Medal Award Address, Industrial and Engineering Chemistry, **29**, 241 (1937).

Thomas Hancock, "Personal Narrative of the Origin and Progress of the Caoutchouc or India-Rubber Manufacture in England." Longman, Brown, Green, Longmans & Roberts, London, 1857.

Charles Goodyear, "Gum Elastic." 2 Vols. New Haven. Vol. I, 1855; Vol. II, 1853.

George Oenslager, "Organic Accelerators," Perkin Medal Award Address, Industrial and Engineering Chemistry, **25**, 232 (1933.)

J. R. Katz, "X-Ray Spectrography of Polymers and in Particular Those Having a Rubber-like Extensibility," Transactions of the Faraday Society, **32**, No. 177, Part 1, 77-94, Jan., 1936; Rubber Chemistry and Technology, **9**, 357-72, 1936.

COUNCIL

March Meeting

The 188th meeting of the National Council of The American Institute of Chemists was held on Tuesday, March 17, 1942, at The Chemists' Club, 52 East 41st Street, New York, N. Y., at 6:30 p.m.

Dr. Harry L. Fisher presided. The following officers and councilors were present: Messrs: E. R. Allen, M. L. Crossley, H. L. Fisher, M. L. Hamlin, R. J. Moore, W. J. Murphy, H. S. Neiman, W. T. Read, F. D. Snell, and M. Toch. Miss V. F. Kimball was present.

The minutes of the previous meeting were approved.

The Treasurer reported that our financial situation was relatively the same as the preceding month, and that a written report would be presented at the next Council meeting.

The report of the committee appointed to select the date and place of the Annual Meeting was read: The meeting will be held at the Claridge Hotel, Atlantic City, New Jersey, on May 16, 1942.

The Committee to select the place of the Annual Meeting was requested to continue as a Program Committee for the Annual Meeting.

The Chairman of the Jury on Medal Award reported that William L. Evans of Ohio State University had been selected as medalist for 1942.

A report from Dr. Turner covering a meeting of the Association of Scientific Workers which he attended as a representative of the Institute was read.

A letter was read from Michael J. Blew, F.A.I.C.

The Secretary read a letter from Louis Freedman, F.A.I.C.

Mr. Murphy reported information which he had secured regarding the proposed Licensure bill.

The Secretary was requested to send a letter to each member of the National Council requesting him to suggest items which should be put into a folder to be used to obtain new members.

The Councilors expressed their deep appreciation of the work which Dr. Read has been doing for the Institute.

Dr. Fisher reported that he had spoken before the Washington Chapter at its recent meeting.

Dr. Hamlin reported that the New York Chapter was continuing its program to introduce a bill for licensure of chemists into the New York State Legislature. A meeting will be called to recommend suitable action in the near future.

The following new members were elected:

FELLOWS:

Casey, Robert S.
Director of Chemical Research, W. A. Sheaffer Pen Company, Fort Madison, Iowa.

Grupelli, Logan D.
Chemical Market Development, National Oil Products Company, Harrison, N. J.

Gwynn, Marion Hayes
Consultant, National Oil Products Company, Harrison, N. J.

Lynch, Kathryn L.
Research Chemist, American Cyanamid Company, Stamford, Conn.

Mileti, Otto Joseph
General Superintendent, Charles R. Long, Jr., Company, Louisville, Ky.

Singleton, Frederick Gray
Industrial Fellow, Mellon Institute, Pittsburgh, Penna.

Williams, Paul DeWitt
Laboratory Foreman, Western Sugar Refinery, San Francisco, California.

ASSOCIATE:

Weingarten, Garry
(A.1942) *Chemist,* Picatinny Arsenal, Dover, N. J.

Upon motion made and seconded, the application of Adam T. Krol to be raised from Associate to Fellow was approved.

There being no further business, adjournment was taken.

Applications for Membership

Action will be taken by the National Council, at its next meeting, on the following applications:

For Fellows

Balassa, Joseph J.
Chemist, Federal Yeast Corporation, Highlandtown, P. O., Baltimore, Md.

Boynton, Emory P.
Patent Attorney, Carbide and Carbon Chemicals Corporation, New York, New York.

Ericks, Walter P.
Chemist, American Cyanamid Company, Stamford, Conn.

Herbst, Robert M.
Assistant Professor of Organic Chemistry, New York University, University Heights, New York, N. Y.

Van Arsdell, Prudence M.
Research Chemist, Universal Oil Products Company, Chicago, Illinois.

For Associate

Smith, Whitfield W.
Chemist, Baker and Company, Newark, New Jersey.

CHAPTERS

New York

Chairman, Donald Price *Vice-chairman,* Elmore H. Northey

Secretary-treasurer, Milton Burton

New York University

New York, N. Y.

Council Representative, Marston L. Hamlin

Niagara

Chairman, L. M. Lawton

Vice-Chairman, George W. Fiero

Secretary, Margaret C. Swisher

Department of Chemistry

University of Buffalo

Buffalo, New York

Council Representative, Arthur W. Burwell

Carl H. Rasch, *Alternate*

Pennsylvania

Chairman, Edward L. Haenisch *Vice-chairman,* J. M. McIlvain

Secretary-treasurer, Clinton W. MacMullen

Rohm and Haas Company

Philadelphia, Penna.

Council Representative, Gilbert E. Seil

News Reporter to THE CHEMIST, Kenneth A. Shull

Washington

President, Ralph B. Deemer

Vice-president, L. F. Rader, Jr. *Treasurer,* L. R. Heiss

Secretary, Ernest J. Umberger

207 Albany Avenue, Takoma Park, Maryland

News Reporter to THE CHEMIST, T. H. Tremearne

Council Representative, Albin H. Warth

The Washington Chapter held the March meeting at the Wardman Park Hotel. A dinner in honor of Dr. Harry L. Fisher preceded the meeting. Considering the number of members who are on various "O.C.D." duties, both the meeting and dinner were well attended.

Chapter president Deemer introduced Dr. Fisher, who responded with an excellent address on the "Human Side of Patents and Inventions". He told of the early work of men who were interested in rubber and the ways in which the researcher is often successful although not well directed. Accidental success in inventions occurs; also discouragement from minor set-backs can terminate a valuable completion of work. Many questions pertinent to the present rubber situation were answered by Dr. Fisher. In keeping with the wartime spirit, we were pleased to see some members and guests in uniform, and we hope that at future meetings the "military" will be well represented.

Dr. Donald H. Andrews of Johns Hopkins University will address the May twenty-ninth meeting at Wardman Park Hotel, at which time the annual election of officers will take place.

The Second National Chemical Exposition will be held at the Stevens Hotel, Chicago, Illinois, November seventeenth to twenty-second. Dr. Roy C. Newton, newly elected chairman of the Chicago Section of the American Chemical Society, which is sponsoring the Exposition, states that "the coming exposition will be important to the allied war program because the United Nations are depending on the American chemical industry to solve many problems in providing alternates for critical materials such as rubber, metal, and other basic substances in which there is a shortage. More than 20,000 industrial chemists, plant executives, engineers and educators are expected to assemble for the exposition and conference."

W. J. Baëza, F.A.I.C., is giving a course in Powder Metallurgy, under the direction of Engineering, Science and Defense Management Training, at the College of the City of New York.

BOOKS

CHEMICAL ENGINEERING FOR PRODUCTION SUPERVISION. By David E. Pierce. *The McGraw-Hill Book Company*. 1942. 6" x 9". 232 pp. $2.50.

This book is written for the use of non-technical operating men of the chemical industry, particularly to familiarize them with the fundamental chemical engineering features of equipment generally needed in the following unit operations: Heat transfer, evaporation, distillation, drying, and flow of fluids. In discussing these subjects, the author has given important theoretical features, a description of mechanical parts of apparatus, whenever necessary, and illustrative problems. Additional examples are also given at the end of each chapter.

In its present form, the value of this book to persons not acquainted with chemistry, physics, and mathematics, will no doubt depend upon the skill of the instructor. However, one with a sufficient knowledge of these subjects or experience in industrial chemistry will find the publication exceedingly useful in developing his ability in chemical engineering calculations. In this connection and for the consideration of future editions of this volume, it is recommended that an additional appendix giving answers to the problems in the text be added.

The "Directory of Libraries Informational Sources", Sixth Edition (1942), has just been published by the Library Company of Philadelphia, Broad and Christian Streets, Philadelphia, Penna.

"Many independent men everywhere in these States, a few years back in their lives, were hired laborers. The prudent, penniless beginner in the world labors for wages awhile, saves a surplus with which to buy tools or land for himself, then labors on his own account another while, and at length hires another new beginner to help him. This is the just and generous and prosperous system which opens the way to all—gives hope to all, and consequent energy and progress and improvement of condition to all. No men living are more worthy to be trusted than those who toil up from poverty—none less inclined to take or touch aught which they have not honestly earned. Let them beware of surrendering a political power which they already possess, and which, if surrendered, will surely be used to close the door of advancement against such as they, and to fix new disabilities and burdens upon them, till all of liberty shall be lost."

—Abraham Lincoln. First Annual Message to Congress, 1861

The American Section of the Society of Chemical Industry held a meeting on March 27th, at The Chemists' Club, New York, N. Y., with chairman Lincoln T. Work, F.A.I.C., presiding. The topic for discussion was "Vitamins", and speakers were Dr. Lela E. Booher of the Milwaukee Childrens' Hospital, on "Chemistry and Nutrition of the Vitamins"; and Mr. George Merck, president of Merck and Company, on "Synthetic Vitamins, A New American Industry."

FROM OUR MEMBERS

Two Reactions to Licensure

"I was present at your meeting on the thirteenth of March when licensing was discussed. I have long felt that licensing would be an important factor in establishing and maintaining the prestige of the profession of chemistry. The enthusiasm at the meeting was genuine enough to make me change my mind about resigning. I would like to see the proposed bill become a law, and will, in fact, be glad to devote some time to it if I can be of some help."

"Under my circumstances I can really not afford to pay dues, but I can much less afford to give up a membership of almost twenty years in an organization that is attempting to bring about such needed legislation as the 'Licensing of the Chemist'—a measure I consider of paramount importance."

After the War

"It seems to me that the Institute can do a big job now in helping Uncle Sam to win this war, and win we will. The biggest opportunity for the Institute will come when the struggle is over, in coördinating, conserving, and protecting the younger chemists, many of whom face the possibility of hunting work. The work of the Institute in this respect appeals to me specifically. I am fifty years old and probably will not have so much to worry about as some of the younger fellows, but I faced just that in 1918-1919."

From New Members

"I may add that I am very much in favor of the four cardinal points of the program for which the Institute is striving and will do everything in my power to further them."

"Your letter notifying me of the acceptance of my application has made me very happy. I consider it an honor to belong to a group which is striving to accomplish such worth while things."

"I am pleased and honored to have the opportunity of being a member of this organization."

"I wish to add that I have read carefully those basic principles to which members of your organization certify and take upon themselves to uphold. For quite a number of years I have always upheld such principles but am sure that the only method of showing my belief in these principles is that of being a member of your organization."

The annual staff dinner of Foster D. Snell, Inc., was held March twentieth at the Brooklyn Club, Brooklyn, New York. The guest speaker of the evening was Mr. Harold St. L. O'Dougherty, attorney, who was for many years United States District Attorney for the Eastern District. Following the talk, movies were shown.

Meeting of the American Association of Scientific Workers

Dr. W. D. Turner attended, as representative of THE AMERICAN INSTITUTE OF CHEMISTS, by invitation, the meeting of the American Association of Scientific Workers on March eleventh, at Columbia University, New York. Dr. Turner reports: "The meeting was conducted under the chairmanship of Dr. H. Grundfest of Rockefeller Institute and informal reports were presented by Dr. Grundfest on the work to date of the British and Australian branches; by Dr. Theodore Rosebury of the Defense Committee of the New York branch of the Association on the results of a questionnaire which he had circulated among their membership; by Dr. Cabot, on personnel shortages, particularly in the medical fields; by Dr. Cruis as representative of the N.D.R.C., on the work of that organization; and by Dr. Behre of Northwestern University on geological aspects of scientific work with special reference to efforts which he has been making to direct specialists, who have been drafted, into those fields where they will be the most useful.

"The meeting was well attended and many interesting points were brought up by discussion from the floor. I extended greetings from the Institute and expressed our interest in the work that they were trying to do."

War Bonds and Stamps Go Over the Top

Major A. Berne-Allen, Jr., F.A.I.C., War Bond Officer, Huntsville Arsenal, Huntsville, Alabama, has a message for all members of the INSTITUTE, as well as for all Americans:

"We Americans have a war to fight and win. Give our fighting men the equipment, the weapons, and the munitions, and they will win it! Buy all the War Bonds and War Savings Stamps you can, and keep on buying them. That will assure the guns, and the tanks, and the ships, and the planes, for victory.

"Everyone in America should ask himself daily, 'What can I do to assure victory?' The answer is plain. Fight if you are able. Curb waste of essential materials and time. Salvage all you can. Do not carry rumors or gossip. Put every available dollar in War Bonds. Aid in the distribution of War Savings Stamps, and accept your change in them. Make it your goal to invest in a stamp a day. It is a little thing, and yet to Uncle Sam it would mean over five billions of dollars a year if we all participated. To be exact, it would be 5110 millions of dollars annually towards defeating the Japanazis! Help Uncle Sam! Help yourself! Buy a stamp a day!"

EMPLOYMENT

Chemists Available

ORGANIC RESEARCH CHEMIST. A.A.I. C., M.A. in Chemistry. Columbia 1936. Experienced in organic research pertaining to lignin and cellulose materials. Also testing or organic and inorganic materials. Development of methods of analyses. Please reply to Box 71. THE CHEMIST.

CHEMIST AND MANUFACTURING PHARMACIST. F.A.I.C., Ph.C. Experienced in chemical and pharmaceutical products, foods, cosmetics, and household specialties. Able to handle analytical, research, production supervision, and formulations, as well as bulk compounding. Known for numerous technical publications in the United States and abroad. Draft-exempt. Please reply to Box 123.

BLACKOUT CHEMIST, F.A.I.C., experienced in the development, manufacture, and application of phosphorescent pigments. Background in physics and physical chemistry and general industrial experience. Cornell Ph.D. Please reply to box 11, THE CHEMIST.

CHEMIST, F.A.I.C. Twenty-three years' experience in paint and varnish industry and allied fields. Factory control and supervision of production. Research and direction of research on paints, varnishes, driers, vegetable oils, dry colors, cleaning compounds, marine coating compositions, fatty acids, etc. Factory design and equipment. Knowledge of Portuguese, German and French. Please reply to Box 121.

Former vice-president and general manager of petroleum marketing company, F.A.I.C. with mechanical engineering and extensive organic chemical research training desires new connection. Extensive knowledge of petroleum refining, transportation, sales and advertising; Owns twelve patents and six applications. Experienced in construction; good general knowledge of chemical industry; able to handle work requiring responsibility and business experience. Age 49, married, exempt from military service; location immaterial, available immediately. Please reply to Box 15, THE CHEMIST.

U. S. Civil Service Commission Announcement

Recruiting Circular 19.

Needed Immediately: Persons to set up Price Stabilization Programs.

Title of Position: Business Specialist (Chemicals and Drugs) $2,600—$5,600.

Options

1. Drugs and Pharmaceuticals.
2. Fine Chemicals.
3. Heavy Chemicals.
4. Miscellaneous Chemicals and Allied Materials.

Principal Business Specialists $5,600.
Senior Business Specialist $4,600.
Business Specialist $3,800.
Associate Business Specialist $3,200.
Assistant Business Specialist $2,600.

Duties: Appointees will be required to negotiate with representatives of trade groups dealing with one or more of the commodities listed above in setting up reasonable price stabilization pro-

grams; to formulate workable regulations to make such controls effective; to study relationships of commodities, etc.

Minimum qualifications: Experience of length and quality to insure familiarity with phases and details of either production or marketing, transportation and final distribution of one or all of above commodities. For Assistant grade, at least two years of experience required. Additional experience of greater responsibility required for higher grades.

Appointments for the duration of the War and in no case more than six months beyond end of War.

Forms may be obtained from the Secretary, Board of United States Civil Service Examiners at any first or second class post office; from district headquarters; or from the U. S. Civil Service Commission, Washington, D. C.

Positions Available

YOUNG CHEMIST. For work in Explosives. Salary $160 to $175 per month. Please reply to Box 30, THE CHEMIST.

WOMEN CHEMISTS. College, about four years' experience. For analytical work. Please reply to Box 32, THE CHEMIST.

RECENT PH.D. Under 30 years of age. For pharmaceutical research and development. Please reply to Box 34, THE CHEMIST.

CHEMIST. Experienced in the manufacture of pigment colors. Please reply to Box 36, THE CHEMIST.

CHEMIST. Trained in resin and plastic technology. Please reply to Box 38, THE CHEMIST.

YOUNG CHEMISTS. For secret ink work. Position outside N. Y. Training period one month in New York. $2000. Please reply to Box 40, THE CHEMIST.

THE AMERICAN INSTITUTE OF CHEMISTS was represented at the Forty-sixth Annual Meeting of The American Academy of Political and Social Science held at the Benjamin Franklin Hotel, Philadelphia, on April tenth and eleventh. The general topic was "Winning Both the War and the Peace".

Milton Burton, F.A.I.C., secretary of the New York Chapter of the Institute, formerly with New York University, is now located at the Metallurgical Laboratories of the University of Chicago, Chicago, Illinois.

A meeting of the New York Branch of the American Pharmaceutical Association was held March ninth at Columbia University College of Pharmacy. Dr. Robert L. Swain, editor of *Drug Topics,* acted as chairman. Dr. Hugh P. Beirne, president N.A.R.D., and secretary of the Connecticut State Board of Pharmacy, discussed "War Problems of Retail Pharmacists." Mr. C. P. Walker, of Merck and Company, spoke on "The Chemical Supply Situation due to the War."

NEW BOOKS

Rubber and its Use

HARRY L. FISHER

$2.25

An authoritative and practical treatment. Rubber cultivation as well as development of synthetic rubber compounds. Dr. Fisher received the 1940 Modern Pioneer Award and is president of American Institute of Chemists.

Chemical Warfare

CURT WACHTEL

$4.00

Various types of lethal gases, their development—evaluation and toxicity, as well as treatment, and psychological aspects, etc.

Fluorescent Light & Its Application

H. C. DAKE — JACK DE MENT

$3.00

Latest developments in ultra-violet radiations and uses of ultra-violet light—including chapters on radioactive minerals, etc.

The Cyclotron

W. B. MANN

$1.50

The description of the cyclotron as a source of protons, deuterons, neutrons and the L-particles. Theoretical, mathematical and mechanical aspects.

Forensic Chemistry

HENRY T. RHODES

$5.00

Chemical methods for the use of the criminologist in identification, proof of corpus delicti, counterfeiting—toxic agents —firearms stains.

Anodic Oxidation of Aluminum and its Alloys

DR. A. JENNY

$6.50

A general survey of the electrolytic behavior of aluminum alloys at the anode.

Electrochemistry and Electrochemical Analysis

Vol. I—Electrochemical Theory

H. J. S. SAND

$2.00

Contents—Theories of inter-tonic attraction—Liquio junction potentials—Electrode potentials of half cells—Irreversible Electrolytic processes polarization—et al.

Electrochemistry and Electrochemical Analysis

Vol. II—Gravimetric Electrolytic Analysis and Electrolytic Marsh Tests

H. J. S. SAND

$2.00

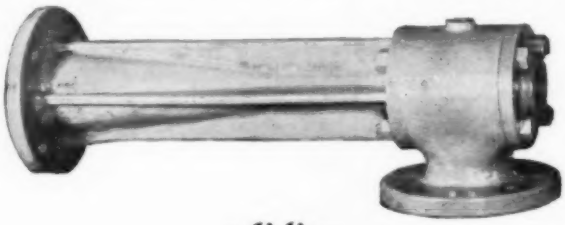
Contents—Apparatus and technique of electrolytic deposition—Quantitative disposition and separation of individual metals —Applications to the analysis of industrial alloys—Electrolytic micro-analysis.

Distributed by

THE CHEMIST

233 Broadway New York, N. Y.

STEAM JET EVACTORS



Aiding

NATIONAL DEFENSE

Numerous Croll-Reynolds Evactors are working overtime maintaining high vacuum in plants making explosives, synthetic rubber, airplane lubricants and a long list of other ordnance materials. They are maintaining high vacuum on engines and turbines of dozens of American ships sailing the seven seas.

While the large and special units require up to three months or more for fabrication the smaller ones are sometimes made in two weeks, or less, when the demand is urgent. These include single and multi-stage units for vacuum up to a small fraction of 1mm. absolute, also small condensers and vacuum chilling equipment.

A recent development is a vacuum-cooled condenser for maintaining condensing temperatures down to 34° F. Inquiries will be handled as promptly as possible under the circumstances.

CROLL-REYNOLDS CO.

ESTABLISHED 1917

17 JOHN STREET NEW YORK, N. Y.